

ATTACHMENT A

2012 INTEGRATED RESOURCE PLAN

EXECUTIVE SUMMARY

KEY FINDINGS AND CONCLUSIONS

- **Seattle City Light should continue on a path of acquiring conservation at an accelerated rate.**

Conservation is the resource of choice. It can be acquired at an accelerated pace in the near term to gain the greatest benefit. The recommended portfolio in the 2012 IRP continues the accelerated conservation strategy approved in the 2010 IRP. Conservation is lower cost than renewable resources, and Initiative 937 (I-937) requires utilities to acquire cost-effective conservation. Because it reduces load, conservation reduces the amount of renewable resources and renewable energy credits (RECs) the utility must acquire to comply with I-937. It has lower risk and higher benefits to the local economy than other resources.

- **The 2012 IRP resource adequacy target was established using a 90% confidence level, revised from 95%.**

An action item from the 2010 IRP Action Plan was to re-evaluate the resource adequacy target. In the 2012 IRP, the target was revised to 90% from 95% confidence of having sufficient resources to self-supply load. Studies found the additional 5% of confidence in having sufficient resources to self-supply requires substantially greater capital outlays and acquiring new generating resources at a much earlier date than with a 90% confidence level. In addition, City Light can self-supply an additional 300 MW of short-term winter capacity using hydro flexibility, flexibility in existing power contracts, and short-term market purchases.

- **Turbine overhauls and maintenance are taking on growing importance in planning resource adequacy as Seattle City Light's hydroelectric generating assets increasingly show their age.**

From 2012—2018, turbine overhauls will occur at Boundary units 51, 53, and 54 and Skagit units 31, 32, 35, and 36. In some cases, as much as 200 MW of capacity can be offline for a single turbine overhaul. While schedules routinely aim to avoid

planned maintenance during periods of high demand, the length of time needed for turbine overhauls can lead to them being offline during winter peak demand periods. The 2012 IRP considers the collective plans for maintenance and turbine overhauls and appropriately adjusts its resource adequacy studies to account for them.

- **The utility can potentially meet energy needs through 2021 without acquiring new firm generating resources.**

For the next decade, City Light expects to be able to meet its resource needs with conservation, increased use of flexibility in existing hydro and contracts, and short-term wholesale market purchases. Load was lost during the recession and the load forecast has slow load growth occurring during a protracted economic recovery.

- **Seattle City Light should continue to acquire renewable energy credits (RECs) as necessary to meet I-937 requirements.**

In 2020, the I-937 requirement for renewables and/or RECs jumps from 9% to 15% of annual load. The utility resource acquisition strategy calls for acquiring an average of about 7.3 average megawatts per year of renewable energy credits or renewable energy in order to meet the requirement. The amount of RECs purchased in any one year will depend on availability, existing REC inventory, and cost. With a recent change in California electricity regulation making it more difficult for California utilities to purchase RECs from the Pacific Northwest, the average price of RECs has fallen, making them a more cost-effective future compliance strategy.

RECOMMENDED RESOURCE STRATEGY

Recommended Portfolio for 2012 IRP (Average Megawatts)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
- Conservation	14	27	41	55	69	83	97	111	125	139	153	167	181	194	205	213	220	227	233	237
- Landfill Gas									8	8	8	8	8	8	8	8	8	8	8	8
- Hydro Efficiency											5	5	5	5	5	5	5	5	5	5
- Geothermal																				20
- Waste Wood Biomass											30	40	40	40	40	40	40	40	40	40
- Wind							10					20	90	100	125	125	125	125	125	125
- Wind 2																	15			
- Solar PV																				20
- RECs (aMW)						3				7										

Seattle City Light's 2012 Integrated Resource Plan (IRP)

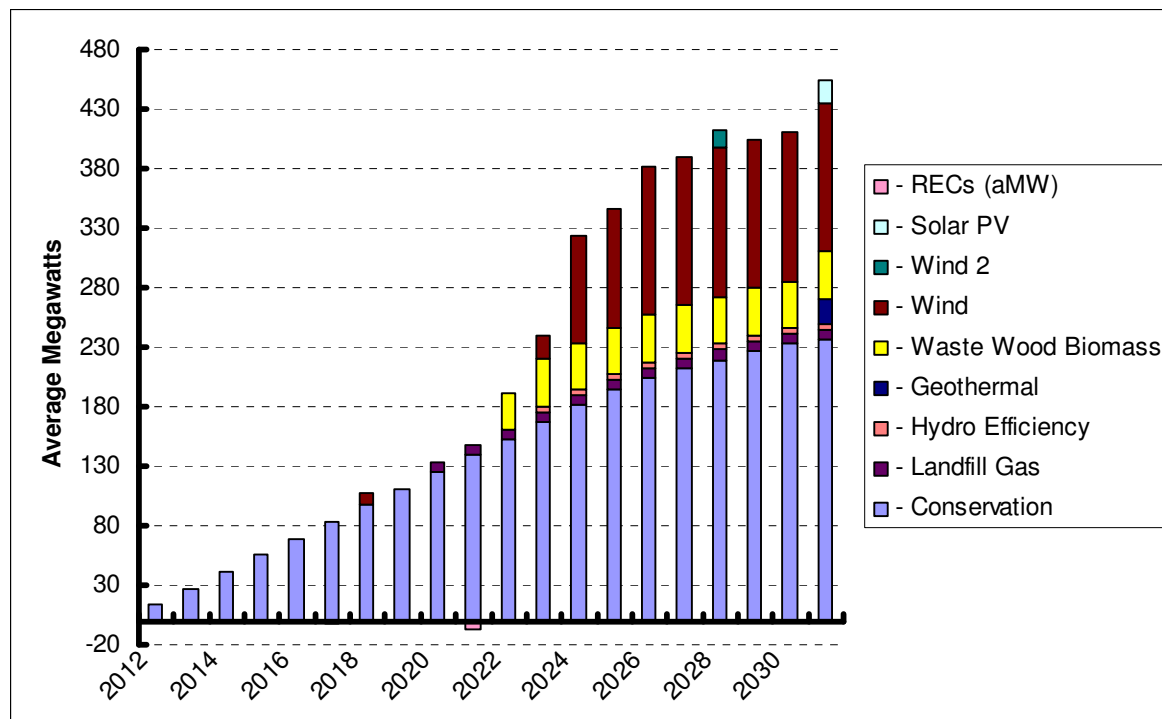
- identifies how much additional seasonal power the utility needs in the winter (when highest demand occurs) through 2031,

- demonstrates how the utility plans to meet growing resource demand and comply with I-937 within a policy context, and
- evaluates candidate resource portfolios against four criteria - reliability, cost, environmental impact and risk - balancing these criteria with public input from a wide range of perspectives.

To meet winter resource needs, City Light's 2012 IRP recommends a long-term conservation and power resource strategy and a short-term action plan. The recommended action plan entails these steps:

- Continue accelerated acquisition of cost-effective conservation at an annual pace of 14 average megawatts in 2013 and 2014.
- Update the conservation potential assessment as needed for use in resource planning and I-937 compliance by year-end 2013.
- Engage BPA to limit cost drivers for Seattle City Light BPA contracts.
- Continue acquiring renewable energy credits (RECs) for I-937 compliance in keeping with the resource acquisition strategy.
- Serve retail load with market purchases and other transactions to reshape seasonal energy as needed.
- Investigate the development status, costs, and commercial availability of resources.
- Work to ensure reliable transmission capacity for serving City Light customers.
- Continue participation in and evaluation of climate change research for impacts to Seattle City Light hydro operations, fish populations, and load as budget allows.

Cumulative New Resource Additions by Year



INTEGRATED RESOURCE PLANNING PROCESS

The two-year planning process that culminated in City Light's preferred portfolio included these steps:

- Public Involvement of citizens and stakeholders with diverse perspectives.
- Recruiting expertise from within the utility.
- Utilizing a detailed computer model of the western electric system, the AURORA[®] Electric Market Model, for evaluating resources, portfolios, and portfolio risk.
- Enhancing modeling capability to better reflect the characteristics of City Light's complex hydroelectric operations and purchase power contracts.
- Forecasting customer demand for power each month through 2031.
- Refining the resource adequacy measure, crucial for defining the timing and amount of future need.
- Developing costs and characteristics of alternative resources to be included in the candidate resource portfolios.
- Designing and modeling candidate resource portfolios for evaluation against four criteria: reliability, cost, risk and environmental impacts.

- Advancing better-performing candidate resource portfolios for further analysis.
- Recommending a long-term resource strategy and near-term resource action plan.

Public Involvement

The IRP stakeholder committee represents residential, commercial and industrial customers, environmental organizations, power resource developers and energy-related government agencies. This committee guided resource planning efforts during a series of meetings with comments, questions and suggestions throughout the process. Members of the public also attended IRP public meetings and offered suggestions that helped to shape the analyses used in the planning process.

The IRP was developed in two phases. In the first phase, we identified initial assumptions, including projected peak demand, forecasts of future energy prices, availability of spot market purchases, resources to consider, resource costs, performance measures and a wide range of potential resource portfolios that could meet the projected demand.

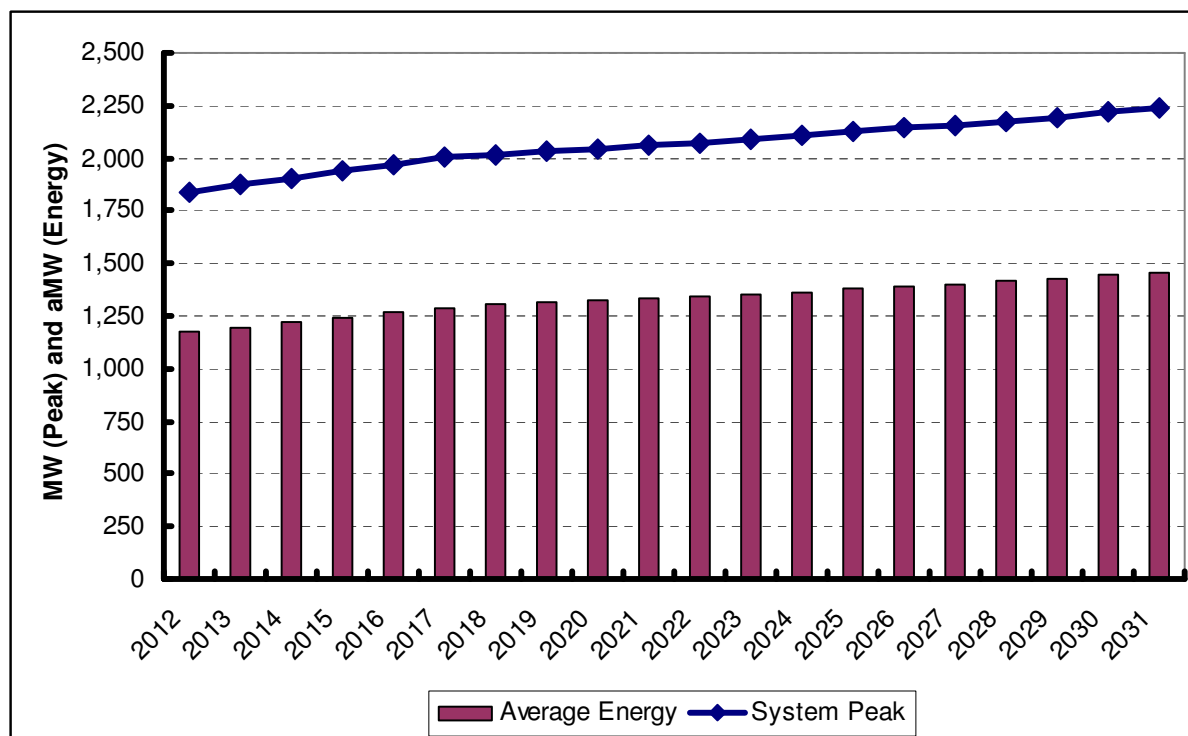
These assumptions were adjusted in response to IRP Stakeholder input. The operations of the alternative resource portfolios were then simulated using a computer model of the electric system in the West. The results of the computer modeling of power operations were evaluated for performance, using the four criteria of reliability, cost, risk and environmental impact.

In second phase of the IRP process, performance measures were used to narrow down the set of resource portfolios, based upon their performance on the four evaluation criteria. After this analysis and consulting with the IRP Stakeholders, a recommended resource portfolio was identified.

Load Forecast and Resource Adequacy

A first step in assessing the need for additional resources is a forecast of Seattle's future electricity demand and establishing a target for the desired level of resource adequacy. The utility's long-range forecast projects a slow recovery from the recession, gradually returning to continued long-term load growth trends in electricity demand for the service area. The IRP treats conservation as a resource and evaluates it in the same way as it evaluates other resources. The graph below shows the load forecast, *assuming no new programmatic conservation*.

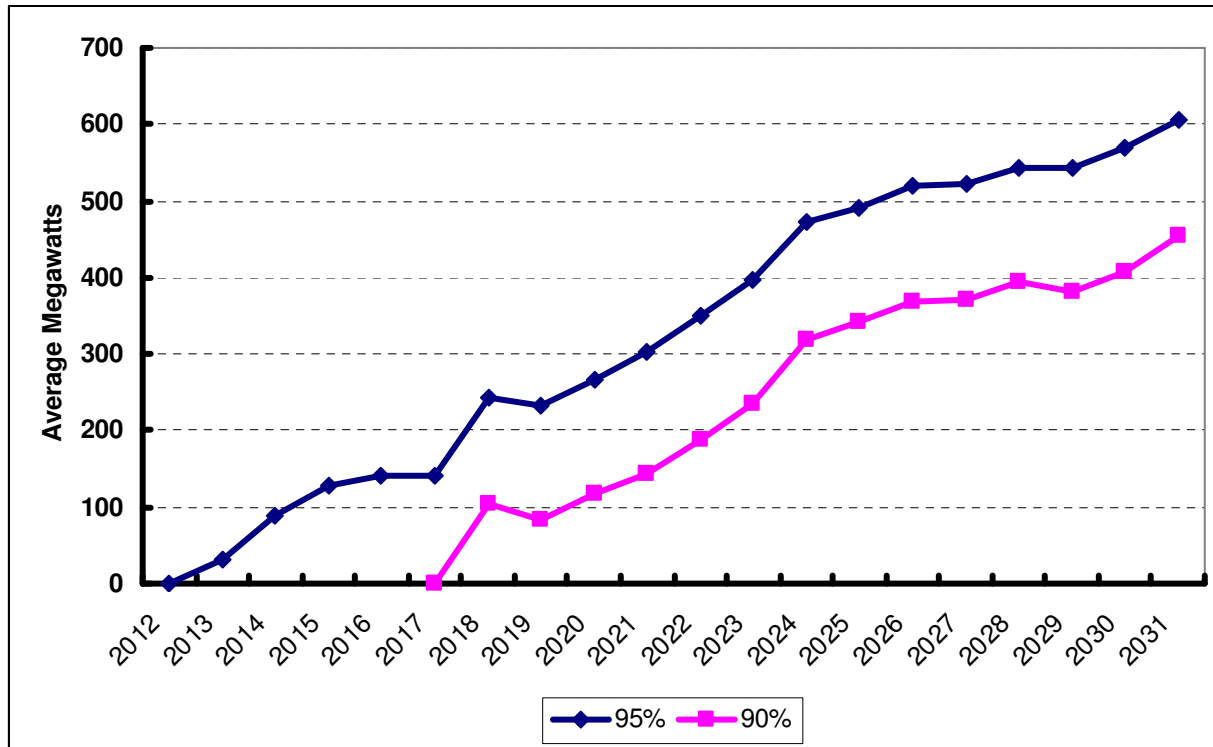
2012 IRP Peak and Average Energy Load Forecast (Before New Conservation)



City Light provides a high level of resource reliability, including the ability to serve load even when hydro generation capability is low. In an average water year and with normal temperatures, City Light has substantial surplus power available to sell in the wholesale power market, even during the winter.

In addition to serving system load on an annual average basis, City Light must also have sufficient resources on a monthly, weekly and hourly basis. The greatest threat to City Light's resource reliability is the combination of low water and high customer demand for power. Low generation capability is usually due to drought conditions in the Pacific Northwest. High customer demand is usually due to extremely low temperatures in the winter. City Light's annual peak demand most often occurs in December or January.

Resource Adequacy Targets at 95% and 90% Confidence Levels (Before New Conservation)



The 2012 IRP relies on a measure of resource adequacy that targets a 90 percent confidence level of meeting loads in all hours in any given December. Using the 90 percent resource adequacy measure and assuming that 300 average megawatts of power can be reshaped, is available from contract flexibility, or hydro flexibility, modeling the operation of City Light's existing resource portfolio shows that the utility needs additional *winter* seasonal resources in 2022. The winter seasonal resource need (after conservation) in 2022 increases through time as loads grow and as existing contracts expire. By 2031 the (after conservation) need for power in the winter grows to 237 average megawatts in the winter.

Existing Resource Portfolio

City Light's existing portfolio includes conservation, generation resources and market resources. City Light policy makers have been committed to conservation as the resource of first choice for over 30 years. Generation resources include low cost City Light-owned hydroelectric projects, power purchased at preference rates from BPA, and contract purchases from other entities. The utility supplements these resources with purchases made in the wholesale power market. City Light's own hydroelectric facilities are located mainly in Washington State. In 2002, City Light added wind power to its

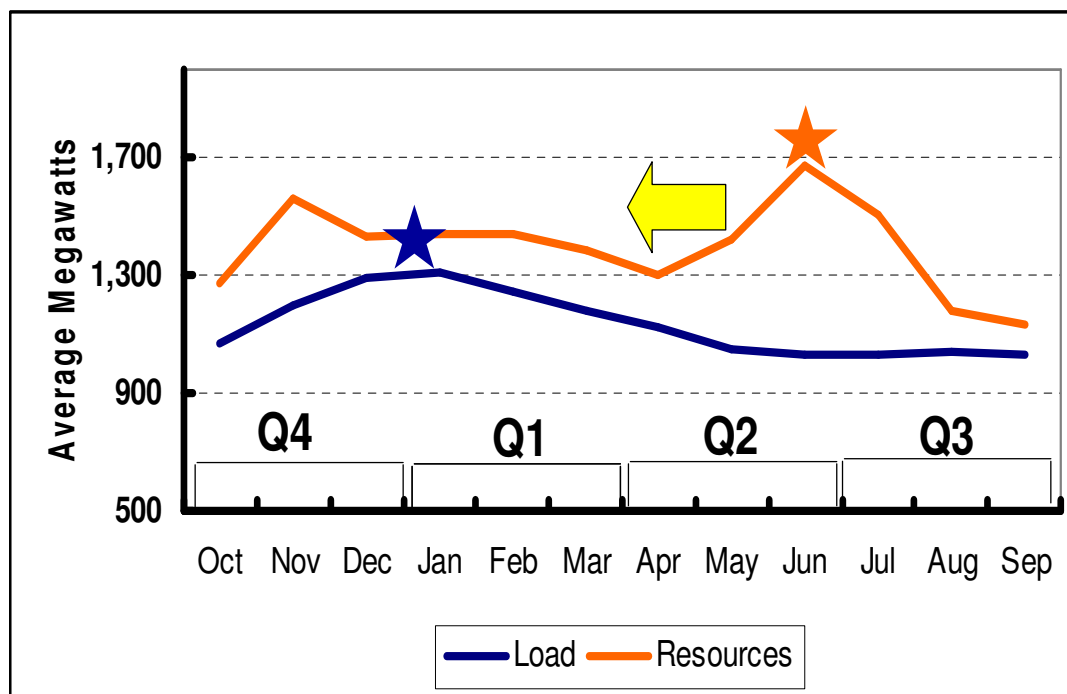
portfolio when it signed a 20-year contract to purchase output from the Stateline Wind Project in eastern Washington and Oregon. City Light has a 20-year power purchase agreement with Waste Management Renewable Energy, to purchase approximately six average megawatts of output from the Columbia Ridge Landfill Gas project in Arlington, Oregon.

Seattle City Light's Generation Resources



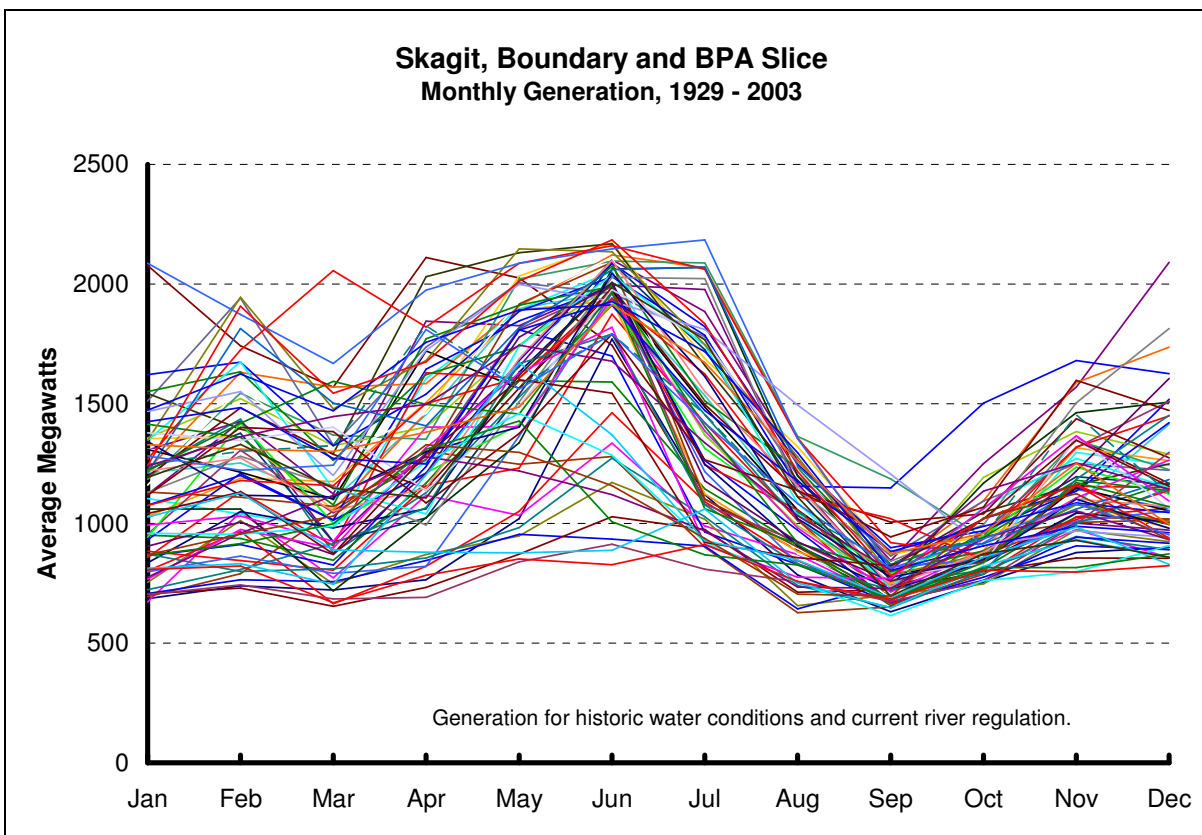
Characteristics of the existing resource portfolio influence the choice of resource additions. The two dominant characteristics are hydro variability and monthly shape. The monthly shape of generation from the existing portfolio is not in synch with service area load. Load is highest in winter, but generation is highest in late spring. This suggests the use of strategies that in effect *reshape* generation to meet winter load. Surplus energy from the 2nd quarter spring runoff can be sold ahead and the proceeds used to buy energy ahead for the 4th and 1st quarters, in effect reshaping the energy from the spring to the winter.

Average Load and Total Resources Are Out of Synch (Seasonal Loads and Resources)



Hydro variability refers to the very broad range of seasonal and annual generation capability determined by precipitation and can be very challenging to manage. The graph below shows what would be generated by the Skagit Project, Boundary Dam and BPA Slice product under conditions of historic water and current river regulation. City Light must ensure that sufficient winter resources are available to provide the power needed by its customers under the combination of drought conditions (such as in 2001) and very low winter temperatures. At the same time, the utility must also make the effort not to acquire too much surplus power, in order to avoid the risk of not being able to sell surplus power at favorable prices.

Seasonal and Annual Variability in City Light Hydro Resources



Policy Direction

Policies that directly affect City Light's Integrated Resource Plan are Washington state Initiative 937, and the Seattle City Council Resolutions 30144 and 30359. Resolution 30144 (2000) gives policy direction to the utility to meet load growth with conservation and renewable resources to the extent possible. Resolution 30144 also gives policy direction to City Light to mitigate greenhouse gas emissions from any fossil fuel use, and sets a long-term goal of "Net Zero" annual greenhouse gas emissions. City Light first achieved Net Zero in 2005 and has remained Net Zero.

The Greenhouse Gas Mitigation Strategy Resolution 30359 (2001) establishes standards for calculating greenhouse gas emissions and mitigation projects. The climate change policy does not prohibit City Light from acquiring electricity from resources that produce greenhouse gas, but does require the utility to fully offset those emissions. Initiative 937 requires utilities with more than 25,000 customers to acquire

cost-effective conservation and to acquire increasing percentages of renewable power and/or renewable energy credits. Initiative 937 has an impact on the both the timing and amount of conservation and renewable resources (or RECs) that the utility must acquire. Seattle City Light's recommended resource strategy complies with the City's interpretation of the initiative.

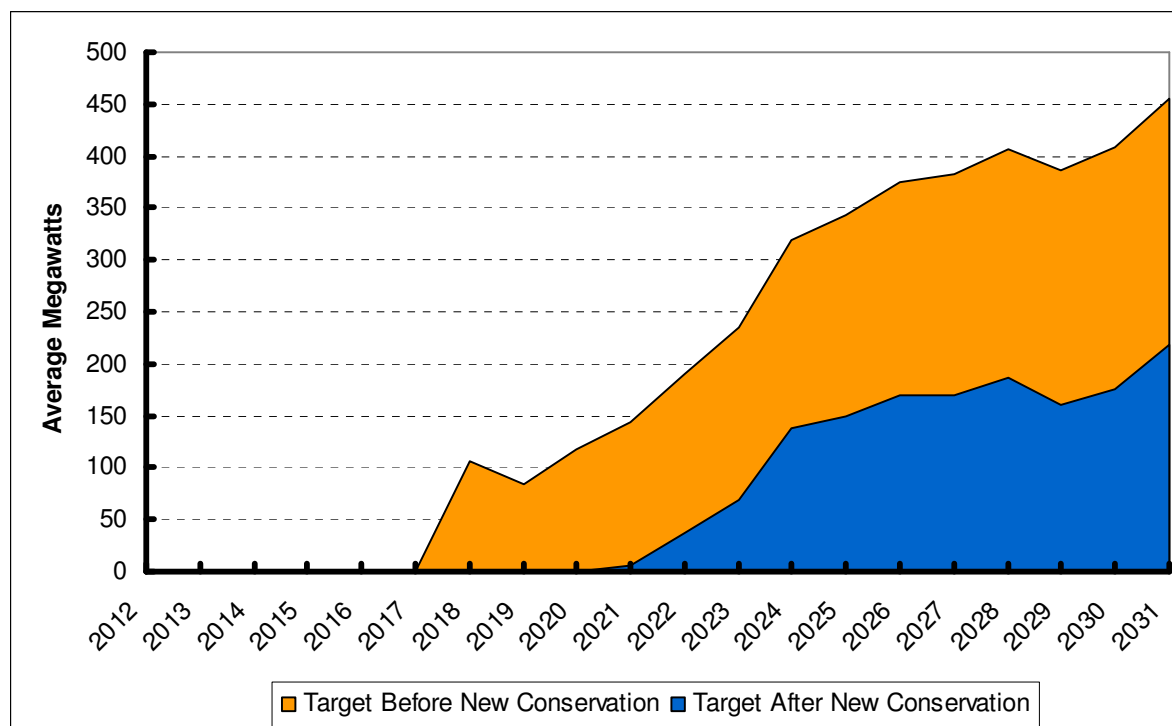
In the 2010 IRP, Seattle City Light conducted a study of impacts to hydroelectric operations from climate change. Using estimates of climate change impacts from the University of Washington Climate Impacts Group (CIG) and the Northwest Power and Conservation Council, City Light developed a model that showed how temperature changes can affect both its own hydro system and its power purchase agreements with other hydroelectric generators, most notably BPA. The impacts to electricity demand from warming temperatures were also evaluated. Modeling indicated that it may be possible to achieve increased generation at the Skagit Project during the fall and winter when Seattle's demand peaks. However, summer generation is expected to decrease, adding to seasonal deficits during the late summer and early fall. City Light recognizes the importance of climate change impacts to a predominantly hydroelectric power system. In the 2012 IRP, recent scientific developments in climate change research are examined to see if new information may shed more light on how City Light may be impacted.

Resource Choices

The three main categories of resources are conservation, generation and the wholesale power market. Generation resources can be further categorized as renewable and nonrenewable.

Conservation City policy guidance and State Initiative 937 require the acquisition of cost-effective conservation. Certain conservation measures can improve load shape because their greatest effect is in the winter when the weather is colder and nights longer, requiring greater electricity use. Conservation also has the benefit of avoiding transmission costs. Conservation resource was the mainstay in both rounds of portfolio analysis, which examined low, constant, and accelerated paces of acquisition.

2012 IRP Resource Adequacy Targets for New Resources (Before and After “Base” Conservation)



Market Near term purchases in the wholesale power market are used to supplement the utility's own generation and long-term contracts, as needed in order to serve retail load.

Renewable Generation Renewable resources satisfy the need for power and avoid air and water pollution that endangers the environment and human health. Renewable resources could become even more advantageous with the eventual imposition of a carbon tax or a cap-and-trade scheme.

Initiative 937 mandates the development of such resources. The availability of transmission could be a problem. The cost of transmission for wind resources is especially high because transmission must be available even when the wind is not blowing. Besides wind, biomass is the renewable resource most likely to be available to City Light in the near term.

Non-Renewable Generation Non-renewable resources are generally fossil fuels such as coal, oil and natural gas. City Light is required by RCW 19.280.030 to evaluate non-renewable generation as well as renewable generation. Most fossil fuel resources have reliability advantages in their generation profile that allows them to meet utility

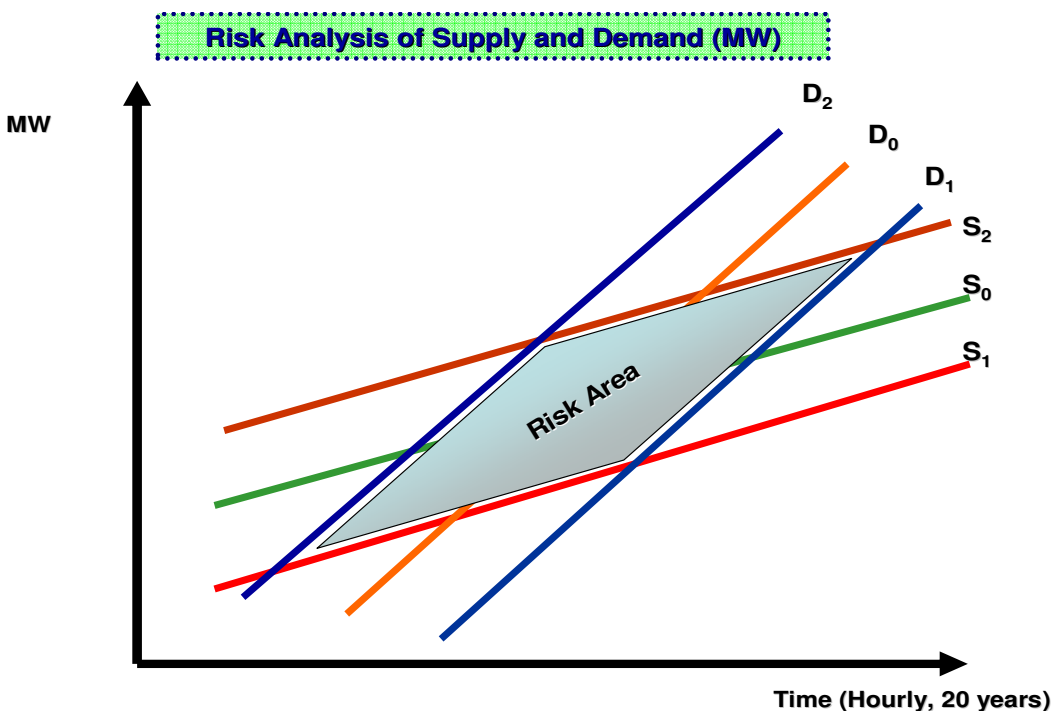
customers' base energy requirements and frees up the hydroelectric resources to follow load. The only fossil fuel resource that can effectively follow load is the natural gas simple-cycle combustion turbine that can be used to meet peak load requirements or to operate during the hours proceeding the peak hour, thus saving hydro power to meet the peak requirements. Natural gas-fired turbines can also provide necessary integration services to intermittent renewable generation, improving reliability of electric service. Three of the eight resource portfolios studied contained natural gas generation.

Portfolio Analysis

Candidate portfolios were simulated within the AURORAxmp® Electric Market Model developed by EPIS, Inc. City Light utilizing spring 2011 forecasts of natural gas prices from Ventyx. The Aurora model contains installed capacity and customer load in the Pacific Northwest electricity market, which is used to forecast regional electricity prices. The model has been customized and calibrated to Seattle City Light's operations.

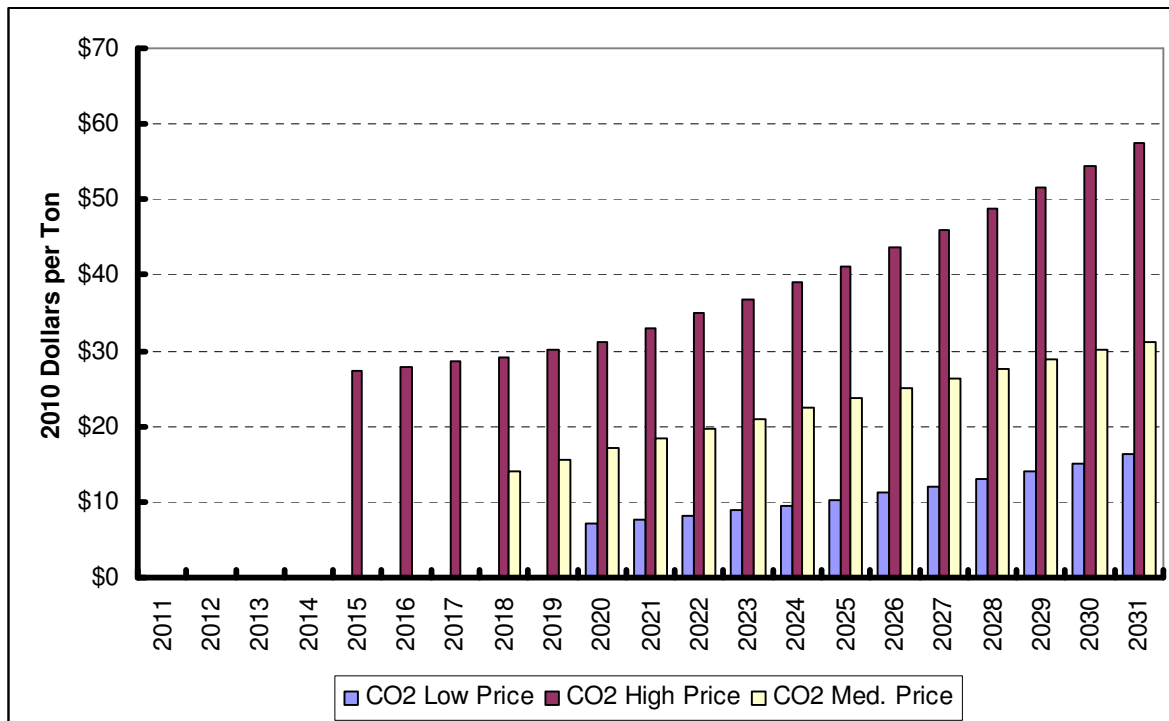
The Aurora model used for analyzing the portfolios simulated their operation based upon the operating characteristics of each resource and its total cost, including fuel, operations and maintenance, and transmission. The amount of greenhouse gas emissions and air pollutants was also calculated. Costs were assigned to these emissions and considered along with the other portfolio costs. At any particular point in time, the least-cost resource was picked first, followed by the next least-cost resource, and so on, until load for that point in time was met. The portfolios were then evaluated using the four criteria:

- **Reliability.** All portfolios were designed to meet the 90 percent resource adequacy measure for winter.
- **Cost.** The net present value (NPV) of cash flows over 20 years for both capital and operating costs were calculated and compared.
- **Risk.** The sources of risk are uncertainty about hydro generation capability, level of demand, and fuel prices. The portfolios varied in their exposure to these sources of uncertainty.



- Environmental impacts.** Carbon dioxide, nitrogen oxides, sulfur dioxide, mercury and particulate emission impacts were assigned costs, which were taken into account in the evaluation of each candidate resource portfolio. Total greenhouse gas and other air pollutant emissions over 20 years were calculated and compared for all portfolios. All resource portfolios that would emit CO₂ were charged the medium CO₂ price for each ton of CO₂ emitted. Later in the process, the top 3 portfolios were tested with high cost and low cost carbon dioxide scenarios. In addition, an Environmental Impact Statement (EIS) is being prepared to further identify and explain a range of potential environmental impacts from the candidate portfolios.

Carbon Dioxide Cost Scenarios (2010 Dollars/Ton)



Candidate Portfolios

The top three candidate portfolios were subjected to risk analysis that varied key assumptions: the level of system load, the price of natural gas, and hydro conditions.

In addition, three scenarios for the costs of emitting carbon dioxide were created. Each of the candidate portfolios was each modeled with the three scenarios to see how they would perform. The low CO2 cost scenario results in higher net power costs for the candidate portfolios, because all the portfolios had already included CO2 costs for any emissions. When CO2 costs are low, then fossil fuel resources are more cost competitive and City Light achieves comparatively less revenue from sales of surplus power in the wholesale power market.

The results in order of lowest cost and risk were:

1. Wind & Gas
2. Renewables: Higher Conservation
3. Renewables: Base Conservation

In 2008, the Seattle City Council requested that City Light's IRP forward three candidate resource portfolios (plans) for evaluation instead of one. The purpose was to enable policy issues to be more fully considered within a process that was strongly quantitative in nature. In completing the 2012 IRP, two of the top three candidate portfolios had disadvantages from the point of view of the 2012 IRP Stakeholders and City Light. The "Wind & Gas" portfolio was seen as inconsistent with environmental objectives and Council resolution 30144 by some IRP Stakeholders. In addition, the "shale gas revolution" was seen as subject to as yet unquantifiable risks, driven by regulatory issues, supply uncertainty, historical price volatility, environmental impacts, and potential pipeline capacity constraints.

The "Renewables: Higher Conservation" candidate portfolio was problematic because of its immediate rate impacts to fund even higher levels of conservation than the accelerated conservation plan approved in the 2010 IRP. The Seattle metropolitan area has been facing challenging economic times as the pace of economic recovery from "the Great Recession" remains painfully slow. At the same time, power prices are very low, so that the benefit of increasing surplus energy and reselling it in the wholesale power market has fallen dramatically.

The "Renewables: Base Conservation" portfolio was found to have several advantages over the other two portfolios. While the plan is forecast to be somewhat higher cost over a 20-year period, it has very little cost difference during the first decade. It continues to pursue the accelerated conservation plan adopted by the Council in the 2010 IRP and is already budgeted. This plan pursues accelerated annual conservation goals that are 100 percent higher than pre-2008 levels. The portfolio is consistent with City policy and Council resolution 30144, which states that City Light should "use cost-effective energy efficiency and renewable resources to meet as much load growth as possible," as part of a goal to meet Seattle's power needs with net zero greenhouse gas emissions. This portfolio is also consistent with the Seattle City Light Strategic Plan preferred option, "Strategic Investments."

Seattle City Light's preferred portfolio for the 2012 Integrated Resource Plan is "Renewables: Base Conservation."

IRP Action Plan, 2012 – 2013

Actions	2012	2013
Conservation Resources		
Pursue accelerated conservation in the amounts targeted in the Renewables: Base Case Conservation portfolio.	14 aMW by end of 4 th Qtr	14 aMW more by end of 4 th Qtr
Update the conservation resource potential assessment for use in resource planning and I-937 compliance	Complete project design and identify data needs	Complete conservation potential assessment
Generation Resources		
Engage BPA to limit the cost drivers for Seattle City Light BPA contracts	Participate in the FY 2013-2014 Rate Cases	Participate in the FY 2013-2014 Rate Cases
Market Resources		
Serve retail load with market purchases, short-term exchanges, and transactions to reshape seasonal energy as needed	Ongoing	Ongoing
Other New Resources		
Continue acquiring RECS, in keeping with the resource acquisition strategy, in order to meet I-937 requirements.	Acquire an annual average of 7.3 aMW of RECs as needed	Acquire an annual average of 7.3 aMW of RECs as needed
Investigate the development status, costs, and commercial availability of resources.	Ongoing	Ongoing
Transmission		
Work to ensure sufficient transmission transfer capability for City Light to support serving peak customer demand	Ongoing	Ongoing
Future IRPs		
Continue to refine forecasts, modeling, and assumptions	Ongoing	Ongoing
Continue participation in and evaluation of climate change research for impacts to hydro operations and fish populations, as budget allows.	Ongoing	Ongoing